

Who will Look After the Orphans?

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Abstract

The status of current taxonomic research in mycology in Australia is analysed. The returns of a questionnaire, and an analysis of 1076 publications incorporating the key words 'Fungi' and 'Australia' listed in *Biological Abstracts* from 1991–95, indicate the unfortunate state of taxonomic mycology in Australia. Although 131 publications are of a taxonomic nature only 61 of these are by Australian researchers on Australian fungi and, of these, 29 are co-authored by a mycologist who is now employed outside Australia. Besides this, 32 of the 61 are taxonomic publications in plant pathology. Only seven publications in taxonomic mycology were published by Australian universities from 1991–95. Most of the remaining publications are by mycologists in government institutions. This indicates the poor state of funding in taxonomic mycology in Australia. The methods used by the Australian Biological Resources Study to direct funds to research on fungi are examined and discussed. Targeting families or habitats are possible ways forward. But who will carry out the investigations needed to complete the *Fungi of Australia* series? Training of mycologists and employment of trained mycologists is of paramount importance and should be carried out in Australian universities. There are very few mycologists in Australian universities and most of these have only a peripheral interest in systematics. Therefore training will need to be carried out in collaboration with Government institutions or with overseas universities or institutions. The need for the promotion of mycology by mycologists, and the need for an organised and coherent approach to this promotion is essential for the future of mycology in Australia.

Introduction

Grgurinovic and Hyde (1993) highlighted the poor state of taxonomic mycology in Australia in 1991. At that time the situation was critical as there was very little undergraduate or postgraduate training in taxonomic mycology in Australian universities and very few university lecturers devoted any of their time to taxonomic mycology. In 1996 the question still remains as to whether or not the situation has improved? In this paper the status of training of taxonomic mycologists is investigated. A questionnaire was published in the *Australasian Mycological Newsletter* in June 1996 and the returns to this survey are presented. Since publications reflect research efforts in government institutions and universities, *Biological Abstracts* from 1991–1995 has been analysed to give a clear picture of what mycological research is being carried out in Australia.

The *Fungi of Australia* series was launched in October 1996 with the publication of Volume 1a and b. The inaugural annual general meeting of the Australasian Mycological Society was also held at this time. This is promising for the future of taxonomic mycology in Australia. The future direction of the *Fungi of Australia* is discussed and recommendations are proposed in order to promote healthy debate. The future of mycology in Australia lies in the hands of its mycologists. There is a need for

mycologists to promote their subject, to articulate its importance, and to make mycology of interest to the general public. Mycologists must have an organised and coherent approach to promoting their passion.

Results of the Survey into Taxonomic Projects in Mycology in Australia in 1996

A questionnaire was published in the *Australasian Mycological Newsletter* in June 1996 asking for information concerning projects in taxonomic mycology in Australia. A total of 10 returns were received and illustrate the nature and extent of work on taxonomic mycology in Australia (Tables 1, 2). The questionnaires were often incomplete, and the author has filled in omissions where the researcher and their work are personally known to him. However, the information provided here provides a reasonably accurate assessment of training and taxonomic research presently being carried out in mycology in Australia.

Besides the startling (but expected) small number of research projects the following observations need raising.

1. There are very few replies from Australian universities.
2. There is no research project with a major taxonomic component being carried out in Australian universities.
3. Several of the researchers are retired and working with minimal or no funding.
4. There is only one fully funded higher degree student being trained in taxonomic mycology in Australia and this student is partially supervised outside Australia. Two other students are receiving their funding and training outside Australia.
5. In most cases few hours are designated to the projects or funding for the projects is minimal.

Table 1. Australians in full time training in taxonomic mycology

Institute	Fungal group	Funding
Hong Kong University	Fungi on palms	Hong Kong University
Department of Primary Industries, Mareeba, Queensland	Phyllachoraceae	Australian Biological Resources Study
Oregon State University	Truffle-like relatives of <i>Russula</i> species	National Science Foundation (USA)

Table 2. Taxonomic mycologists in full time employment in Australia

Institution	Fungal group	Employer
Department of Primary Industries, Indooroopilly, Queensland	Plant pathogens	Queensland Government
Institute for Horticultural Development, Melbourne, Vic	Plant pathogens	Victorian Government
Agricultural Research and Veterinary Centre, Orange, NSW	Plant pathogens	New South Wales Government
Royal Botanic Gardens Melbourne	Basidiomycetes	Victorian Government
University of Tasmania	Basidiomycetes	University of Tasmania

Tables 1 and 2 do not include those taxonomic mycologists who have retired and are working unfunded, or those who carry out taxonomic mycology in their own time. To most mycologists the results should be of no surprise and these returns indicate a worsening trend compared to the results of Grgurinovic and Hyde (1993).

Publications in Mycology from 1991 to 1995

Publications, rather than surveys, are more likely to provide an accurate appraisal of the type of mycological research being carried out in Australia. Although publications will be biased towards active researchers this should balance out across the range of mycological subjects. The key words 'Fungi' and 'Australia' were used to extract publications of a mycological nature involving Australia in *Biological Abstracts* from 1991 to 1995. A total of 1076 publications were abstracted and sorted into subject areas (Table 3).

There were problems in sorting as there is an overlap of subject areas in some papers. Some plant pathology papers have a cell biology component and these are categorised as plant pathology only. Some publications categorised under biological control could have been included under Plant Pathology, and many publications categorised as taxonomic, describe plant pathogens. There are obviously places where it was difficult to decide on a category for a particular publication, and other scientists may have chosen differently from the author. Some publications describing a small number of Australian fungi in taxonomic monographs by non-Australian mycologists may not have been abstracted. However, the results provide an overall picture of the nature of mycological research in Australia between 1991 and 1995.

The results, with respect to taxonomy, are quite surprising. The majority of publications (460) are of a plant pathological nature, while taxonomic mycology scored second highest with 131 publications. Subject areas which seem relatively healthy are cell biology/genetics (118), human mycology (80), biological control (58), mycorrhizae (48), biotechnology (45) and fungal ecology (37). Nearly all of the publications, with the exception of the taxonomic publications, are written by Australian mycologists describing research carried out in Australia, and reflect the industrial or human importance of these subject areas. One surprisingly well-published (presumably well-funded) area is fungi and diet in mammals. This is a prime example of funding being available for research on cuddly furry large animals (politically nice) with little human or industrial value, while insufficient money is available for research into potentially important, but tiny (and therefore supposedly irrelevant) fungi. Areas such as biodeterioration and food microbiology can consider themselves relatively poorly funded.

Table 3. Publications in mycology (from *Biological Abstracts* 1991 to 1995, using the key words 'Fungi' and 'Australia')

Subject	No.	Subject	No.
Magic mushrooms	2	Fungal ecology	37
Mushroom production	2	Biotechnology	45
General microbiology	9	Mycorrhizae	48
Biodeterioration	12	Biological control	58
Food microbiology	13	Human mycology	80
Nothing to do with fungi	18	Genetics/cell biology	118
Medical (animals)	20	Taxonomy	131
Diet and dung	21	Plant pathology	460

A breakdown of the 131 taxonomic publications is given in Table 4. Twenty-seven publications are by non-Australian mycologists discussing Australian fungi. In contrast only 11 publications by a single Australian mycologist discuss mainly non-Australian fungi. Of the remaining 72 papers written by Australian mycologists, 4 are of a general nature, 7 describe lichens, and the remaining 61 discuss Australian fungi. A breakdown of these 61 publications is provided in Table 5. The most startling conclusion is that nearly 50% of these 61 publications are written by a single mycologist who is no longer in Australia. Thirty-two of these publications also discuss or describe plant pathogens and only 18 of these publications describe non-pathogenic microfungi. In 5 years only 7 publications in taxonomic mycology have been produced by Australian universities. Since publications reflect research (and funding), this is not a criticism of the work of mycologists, but clearly reflects the poor funding and employment opportunities for taxonomic mycological research in our Government institutions and in particular the critical situation in our universities.

Who will Do the Research and How Will it be Funded?

To date topics of research for the *Fungi of Australia* have involved mostly visible target groups, often related to the interests of Australian mycologists. There is merit to this approach as who can tackle groups where Australian mycologists have no interest or little expertise? Although these fungi are often easily seen on account of their large size or striking symptoms, they account for less than about 1 in 30 of all fungi, the less visible fungi making up the majority. It is therefore important that the microfungi are given considerable funding in the next decade. It is also important that non-economic groups are given priority over economic groups, since the latter groups could obtain funding from elsewhere.

Table 4. Breakdown of the 131 publications from 1991–1995 in taxonomic mycology

Category	Mycologist Non-Australian	Mycologist Australian
General paper		4
Lichens	6	7
Non-Australian fungi	15	11 ¹
Australian fungi	27	61(29 ¹)
Total	48	83

¹Co-authored by a single researcher who is presently employed outside Australia.

Table 5. Breakdown of 61 publications in taxonomic mycology between 1991 and 1995 by Australian mycologists on Australian fungi

Category	Number	University	Non-university
Macrofungi	11	2	9
Plant pathogens	32	4	28(13 ¹)
Non pathogenic macrofungi	18	1	17(16 ¹)
Total	61	7	54(29 ¹)

¹By a single researcher who is presently employed outside Australia.

Unfortunately, it would be very difficult to investigate families of microfungi as the researcher would need to examine numerous microhabitats in numerous regions, if more than a cursory monograph is to be written. The research and proposed volumes (Volumes 4a-x) on habitat based taxonomy are therefore the obvious research approach that should be taken. This would provide many advantages:

1. The investigator would receive a wide training in mycology and would not become a specialist in any particular Order or Family. Australia cannot afford to train mycologists with a narrow expertise as it is unlikely they would find future employment.

2. Collections of a wide range of fungi would be made and placed into Australian herbaria. These can then be the basis for later taxonomic studies of Orders and Families of microfungi.

3. Information on the particular habitat for the *Fungi of Australia* volume would be available.

The lack of taxonomic mycologists in Australia has already been mentioned and therefore who will work on the future volumes of the *Fungi of Australia*? The answer lies in those students presently being trained. It is essential that funding is provided to these fresh graduates so that they can develop their mycological expertise in Australia and write future volumes of the *Fungi of Australia*.

Training of Future Taxonomic Mycologists

The training of future mycologists is problematical since there is very little mycology taught at Australian universities and there are very few lecturers with more than a peripheral interest in taxonomic mycology. It is unlikely that these lecturers will go out of their way to get funding for taxonomic projects, although there are good students in Australian universities with a strong interest in mycology (Guest, pers. comm.). There are presently three students being trained in taxonomic mycology, although only one of these is funded and working in Australia. Other students of mycology being trained in Australian universities have projects which involve a minor taxonomic component or are only partially funded. This situation is far from ideal and must be changed.

The best way forward is for mycologists in Australian universities to collaborate with taxonomic mycologists in Government institutions or overseas universities and institutions in training young Australians. The mycologists in universities must realise that most of the burden is with them. They must actively encourage students to take an interest in taxonomic mycology. They must seek support for taxonomic research in the form of research funds from the various grant-awarding bodies. The Government institution mycologists must also play a role. They must actively seek collaborative projects with university mycologists in order to train students together.

Finally a balanced approach must be taken. The students should receive training in a wide range of taxonomic groups so that they can more easily find employment following graduation and can tackle future volumes of the *Fungi of Australia*.

The Future of Mycology in Australia

The poor state of mycology in Australia is obvious, yet what can be done in order to improve this situation? Unfortunately, nothing will happen unless the few remaining Australian mycologists fight back. Recent grant applications to the Wet Tropics Rain Forest Management Authority have been unsuccessful, despite the fact that one of their reviewers for world heritage listing have indicated that they had omitted any mention on how they were to address the role and speciation of fungi (Young, personal

communication). There is also frustration as requests for funding for mycological research falls on 'deaf ears' (Young, 1988, 1994). The report on a national workshop on *Taxonomy in Crisis* held in Canberra in October 1995 (Visser, 1996) deals with the Australian Biological Resources Study (ABRS) strategies for increasing numbers of taxonomists in Australia, and the amount of taxonomic work being carried out in Australia. No mycologist was invited to the workshop which took no note of Grgurinovic and Hyde (1993). Therefore, although the need for the training of experts and the need for research into lower plants is addressed, the message that the need for funding in mycological research, the largest and probably the most important kingdom (both ecologically and in potential usefulness to mankind) is critical, has been sadly missed.

The incorporation of the Australasian Mycological Society finally provides mycologists with a voice. All Australian mycologists have a role to play in promoting taxonomic mycology. All mycologists must stand as a strong coherent group and educate the Government and the public of the importance of mycology to industry, to agriculture, and the potential benefits of taxonomic mycological research.

For its part, ABRS must support training of mycologists in universities in collaboration with Government institutes or overseas universities. Other funding bodies, in particular the Co-operative Research Centre for Tropical Rainforest Ecology and Management and the Australian Research Council, must be made aware of the critical situation of taxonomic mycology in Australia and begin to fund training and ongoing employment. It is only then that the decrease in fungal systematists in Australia can be halted.

References

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